

## 299-W11-63 (A7305) Log Data Report

### Borehole Information:

<b>Borehole:</b> 299-W11-63 (A7305)		<b>Site:</b> 216-T-6 Crib			
<b>Coordinates</b> (WA State Plane)		<b>GWL (ft)<sup>1</sup>:</b> Not deep enough		<b>GWL Date:</b> 1/13/2003	
<b>North</b>	<b>East</b>	<b>Drill Date</b>	<b>TOC<sup>2</sup> Elevation</b>	<b>Total Depth (ft)</b>	<b>Type</b>
136,652.77 m	567,197.97 m	Sept. 1947	216.374 m	160	Cable Tool

### Casing Information:

Casing Type	Stickup (ft)	Outer Diameter (in.)	Inside Diameter (in.)	Thickness (in.)	Top (ft)	Bottom (ft)
Welded steel	0.92	8 5/8	8	0.3125	+0.92	155
The logging engineer measured the casing stick up using a steel tape. A caliper was used to determine the outside casing diameter. The caliper and inside casing diameter were measured using a steel tape. Measurements were rounded to the nearest 1/16 in. Casing thickness was calculated.						

### Borehole Notes:

Borehole coordinates, elevation, and well construction information are from measurements by Stoller field personnel, HWIS<sup>3</sup>, and Chamness and Merz (1993). Zero reference is the top of the 8-in. casing. Top of casing is cut unevenly. A reference point survey "X" is located at the top of the casing stickup.

### Logging Equipment Information:

<b>Logging System:</b>	Gamma 1D	<b>Type:</b>	SGLS (35%)
<b>Calibration Date:</b>	9/2002	<b>Calibration Reference:</b>	GJO-2002-385-TAC
		<b>Logging Procedure:</b>	MAC-HGLP 1.6.5, Rev. 0

### Spectral Gamma Logging System (SGLS) Log Run Information:

Log Run	1	2	3	4/Repeat	
Date	1/24/03	1/27/03	1/28/03	1/28/03	
Logging Engineer	Spatz	Spatz	Spatz	Spatz	
Start Depth (ft)	26.0	155.0	53.0	49.0	
Finish Depth (ft)	1.0	52.0	25.0	34.0	
Count Time (sec)	200	200	200	200	
Live/Real	R	R	R	R	
Shield (Y/N)	N	N	N	N	
MSA Interval (ft)	1.0	1.0	1.0	1.0	
ft/min	N/A <sup>4</sup>	N/A	N/A	N/A	
Pre-Verification	AD052CAB	AD054CAB	AD055CAB	AD055CAB	
Start File	AD053000	AD054000	AD055000	AD055029	
Finish File	AD053025	AD054103	AD055028	AD055044	

Log Run	1	2	3	4/Repeat	
Post-Verification	AD053CAA	AD054CAA	AD055CAA	AD055CAA	
Depth Return Error (in.)	0	0	NA	0	
Comments	No fine-gain adjustment.	No fine-gain adjustment.	No fine-gain adjustment.	No fine-gain adjustment.	

### **Logging Operation Notes:**

Zero reference was top of the 8-in. casing. Logging was performed with a centralizer installed on the sonde. Pre- and post-survey verification measurements for the SGLS employed the Amersham KUT ( $^{40}\text{K}$ ,  $^{238}\text{U}$ , and  $^{232}\text{Th}$ ) verifier with serial number 118. During SGLS logging, fine-gain adjustments were not needed to maintain the 1460-keV ( $^{40}\text{K}$ ) photopeak at a pre-described channel. Before the first log run began, the sonde was run up and down the borehole one time to displace any radon gas if present.

### **Analysis Notes:**

<b>Analyst:</b>	Sobczyk	<b>Date:</b>	02/03/03	<b>Reference:</b>	GJO-HGLP 1.6.3, Rev. 0
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SGLS pre-run and post-run verification spectra were collected at the beginning and end of each day. The verification spectra were all outside the control limits established on 12/05/2002, except for spectrum AD055CAA. The pre-run verification spectra were all above the upper control limit for the 609-keV full-width at half-maximum value. In addition, pre-run verification spectra AD052CAB and AD054CAB were above the upper control limit for the 1461-keV full-width at half-maximum value. Post-run verification spectra AD053CAA and AD054CAA were below the lower control limit for the 1461-keV peak counts per second (cps). Post-run verification spectrum AD054CAA was below the lower control limits for the 609-keV and 2615-keV peak cps. The peak cps at the 609-keV, 1461-keV, and 2615-keV photopeaks on the post-run verification spectra as compared to the pre-run verification spectra for each day were between 1 and 14 percent lower at the end of each day. Examinations of spectra indicate that the detector functioned (i.e. decreasing efficiency throughout the day's logging) during all of the logging runs, and the spectra are provisionally accepted.

Log spectra for the SGLS were processed in batch mode using APTEC SUPERVISOR to identify individual energy peaks and determine count rates. Post-run verification spectra were used to determine the energy and resolution calibration for processing the data using APTEC SUPERVISOR. Concentrations were calculated in EXCEL (source file: G1DSept02.xls), using parameters determined from analysis of recent calibration data. Zero reference was the top of the 8-in. casing. On the basis of Chamness and Merz (1993), the casing configuration was assumed to be one string of 8-in. casing to total depth (155 ft). The casing correction factor was calculated assuming a casing thickness of 0.3125 in. This casing thickness is based upon the field measurement. A water correction was not needed or applied to the data. Dead time corrections are required when dead time exceeds 10.5 percent. As the dead time did not exceed 10.5 percent, a dead time correction was not needed or applied.

### **Log Plot Notes:**

Separate log plots are provided for gross gamma and dead time, naturally occurring radionuclides ( $^{40}\text{K}$ ,  $^{238}\text{U}$ , and  $^{232}\text{Th}$ ), and man-made radionuclides. Plots of the repeat logs versus the original logs are included. In addition, a comparison log plot of man-made radionuclides is provided to compare the data collected in 1995 by Westinghouse Hanford Company's Radionuclide Logging System (RLS) with SGLS data. For each radionuclide, the energy value of the spectral peak used for quantification is indicated. Unless otherwise noted, all radionuclides are plotted in picocuries per gram (pCi/g). The open circles indicate the minimum detectable level (MDL) for each radionuclide. Error bars on each plot represent error associated with counting statistics only and do not include errors associated with the inverse efficiency function, dead time correction, or casing correction. These errors are discussed in the calibration report. A combination plot is also included to facilitate correlation. The  $^{214}\text{Bi}$  peak at 609 keV was used to determine the naturally

occurring  $^{238}\text{U}$  concentrations on the combination plot rather than the  $^{214}\text{Bi}$  peak at 1764 keV because it exhibited slightly higher net counts per second.

### **Results and Interpretations:**

$^{137}\text{Cs}$  was the only man-made radionuclide detected in this borehole.  $^{137}\text{Cs}$  was detected near the ground surface (1 ft) at a concentration of 0.8 pCi/g.  $^{137}\text{Cs}$  was detected in the interval from 33 through 48 ft. The range of concentrations was from 0.3 to 23 pCi/g, which was detected at 40 ft.

Recognizable changes in the KUT logs occurred in this borehole. Changes of 4 pCi/g or more in apparent  $^{40}\text{K}$  concentrations occur at approximately 36, 53, 117, 123, 134, 138, and 143 ft. The increase in  $^{40}\text{K}$  concentrations at about 36 ft may represent the transition from the coarse-grained sediments of the Hanford H1 to the finer grained sediments of the Hanford H2. Between 108 and 117 ft, the fine-grained member of the Cold Creek Unit (formerly known as the Early Palouse Soil) is shown by an increase in total gamma (50 cps) and  $^{232}\text{Th}$  (0.5 pCi/g). There is about an 8-pCi/g decrease in  $^{40}\text{K}$  concentrations in the intervals between 117 through 123 ft and 134 through 138 ft.  $^{238}\text{U}$  increases by approximately 2 pCi/g in the interval between 134 and 138 ft. On the basis of the low  $^{40}\text{K}$  concentrations, the carbonate-rich paleosols of the Cold Creek Unit are interpreted as being in the intervals between 117 and 123 ft and 134 and 138 ft. The caliche layer with characteristically high uranium content (greater than 2.0 pCi/g) is present between 134 and 138 ft.  $^{232}\text{Th}$  concentrations decrease by approximately 0.5 pCi/g in the interval between 134 and 138 ft.

The plots of the repeat logs demonstrate reasonable repeatability of the SGLS data for both the man-made and natural radionuclides (661, 609, 1461, 1764, and 2614 keV).

Gross gamma logs from Fecht et al. (1977) (attached) indicate that the sediments surrounding this borehole contained small amounts of gamma-emitting contamination as early as 1963 through at least 1976. The logs from 4/26/63 and 5/6/76 detected gamma activity above background in the interval from 33 ft (10 m) to 46 ft (14 m). The SGLS detected  $^{137}\text{Cs}$  between 33 and 48 ft.

Comparison log plots of data collected in 1995 by Westinghouse Hanford Company and in 2003 by Stoller are included. The 1995 concentration data for  $^{137}\text{Cs}$  are decayed to the date of the SGLS logging event in January 2003. Since 1995,  $^{137}\text{Cs}$  activities appear to have decreased as predicted by radioactive decay.

### **References:**

Chamness, M.A., and J.K. Merz, 1993. *Hanford Wells*, PNL-8800, Pacific Northwest Laboratory, Richland, Washington.

Fecht, K.R., G.V. Last, and K.R. Price, 1977. *Evaluation of Scintillation Probe Profiles from 200 Area Crib Monitoring Wells*, ARH-ST-156, Atlantic Richfield Hanford Company, Richland, Washington.

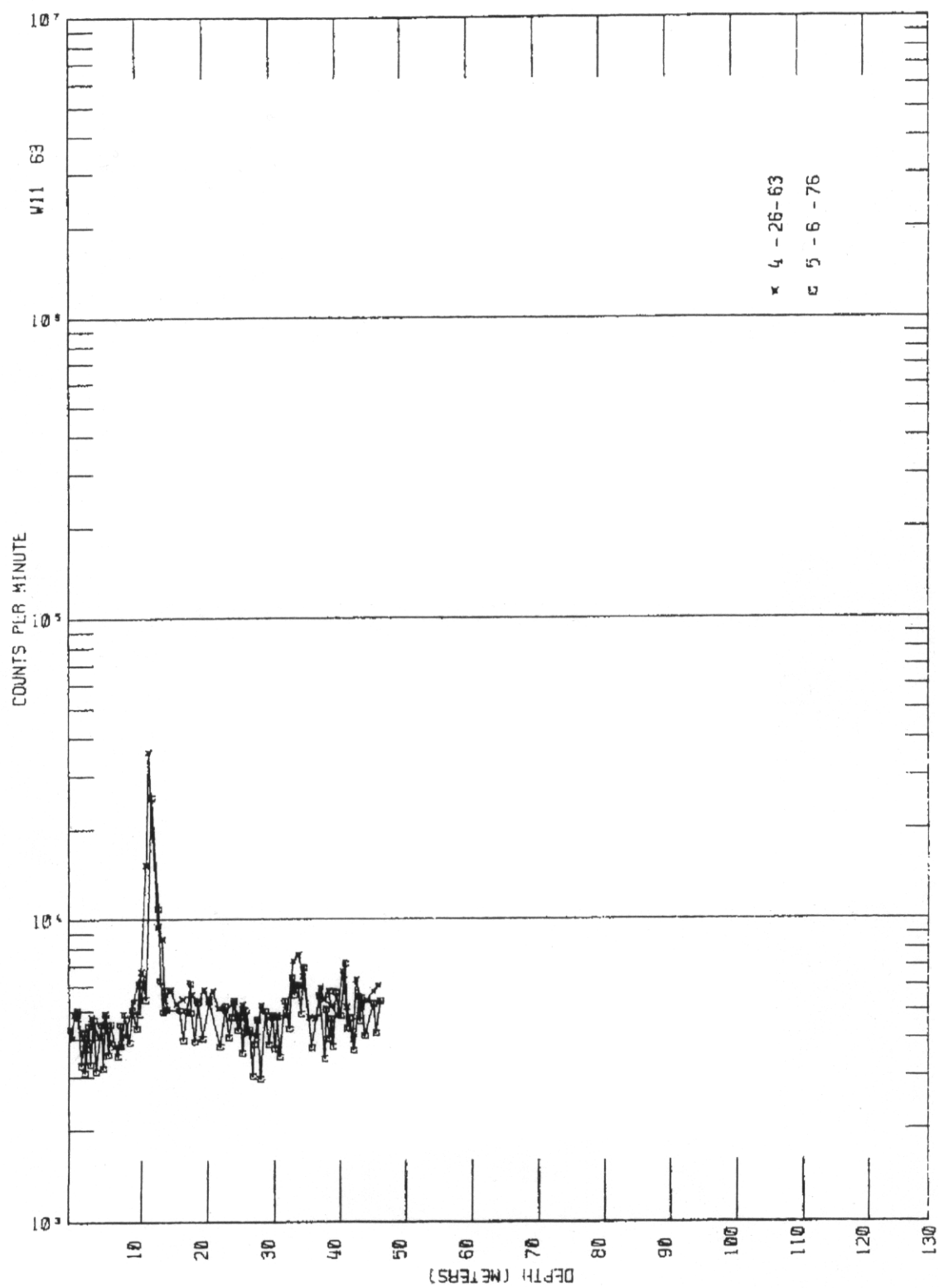
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<sup>1</sup> GWL – groundwater depth

<sup>2</sup> TOC – top of casing

<sup>3</sup> HWIS – Hanford Well Information System

<sup>4</sup> N/A – not applicable

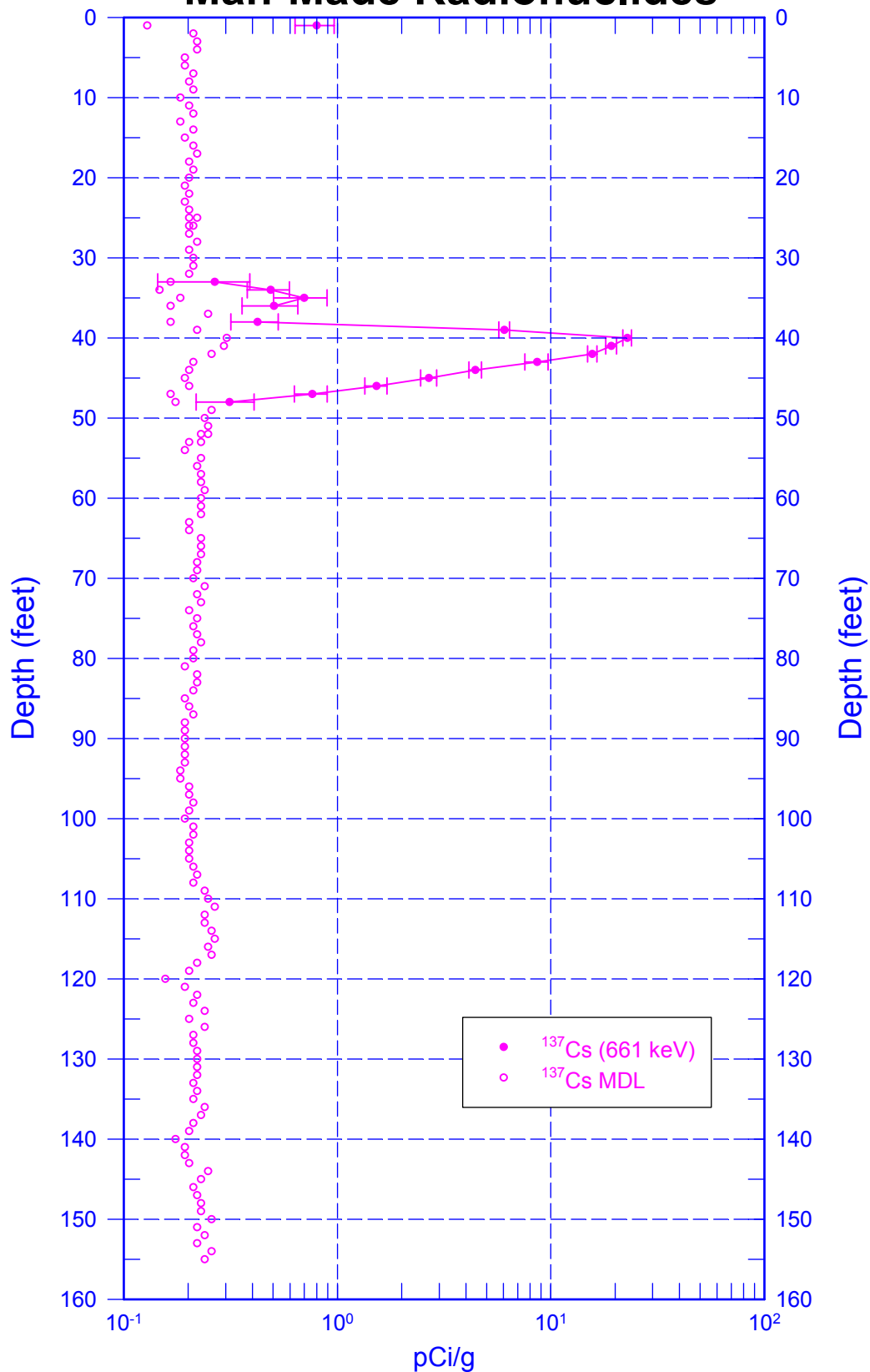


from Fecht et al. (1977)

*Scintillation Probe Profiles for Borehole 299-W11-63, Logged on 4/26/63 and 5/6/76*

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## Man-Made Radionuclides

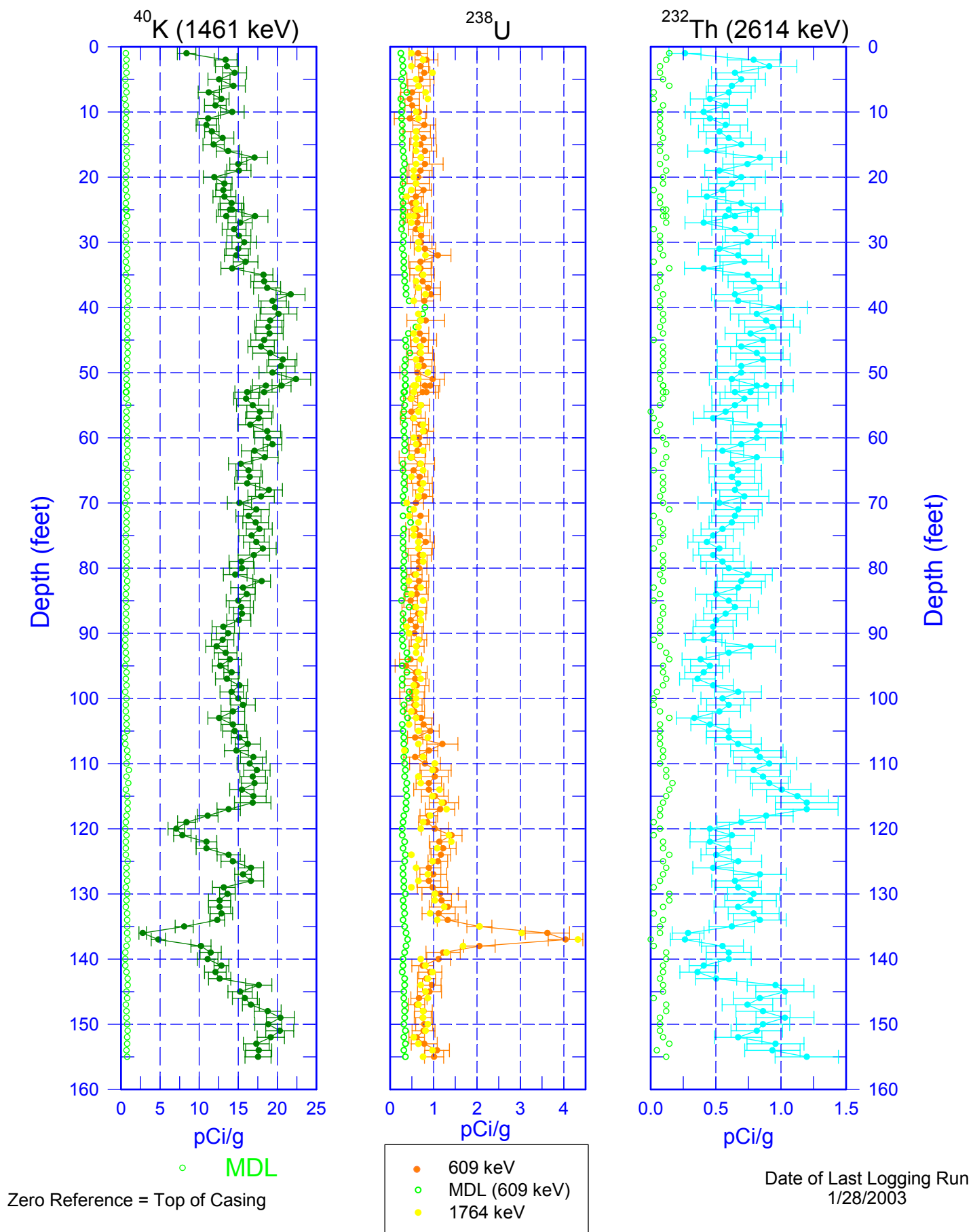


Zero Reference = Top of Casing

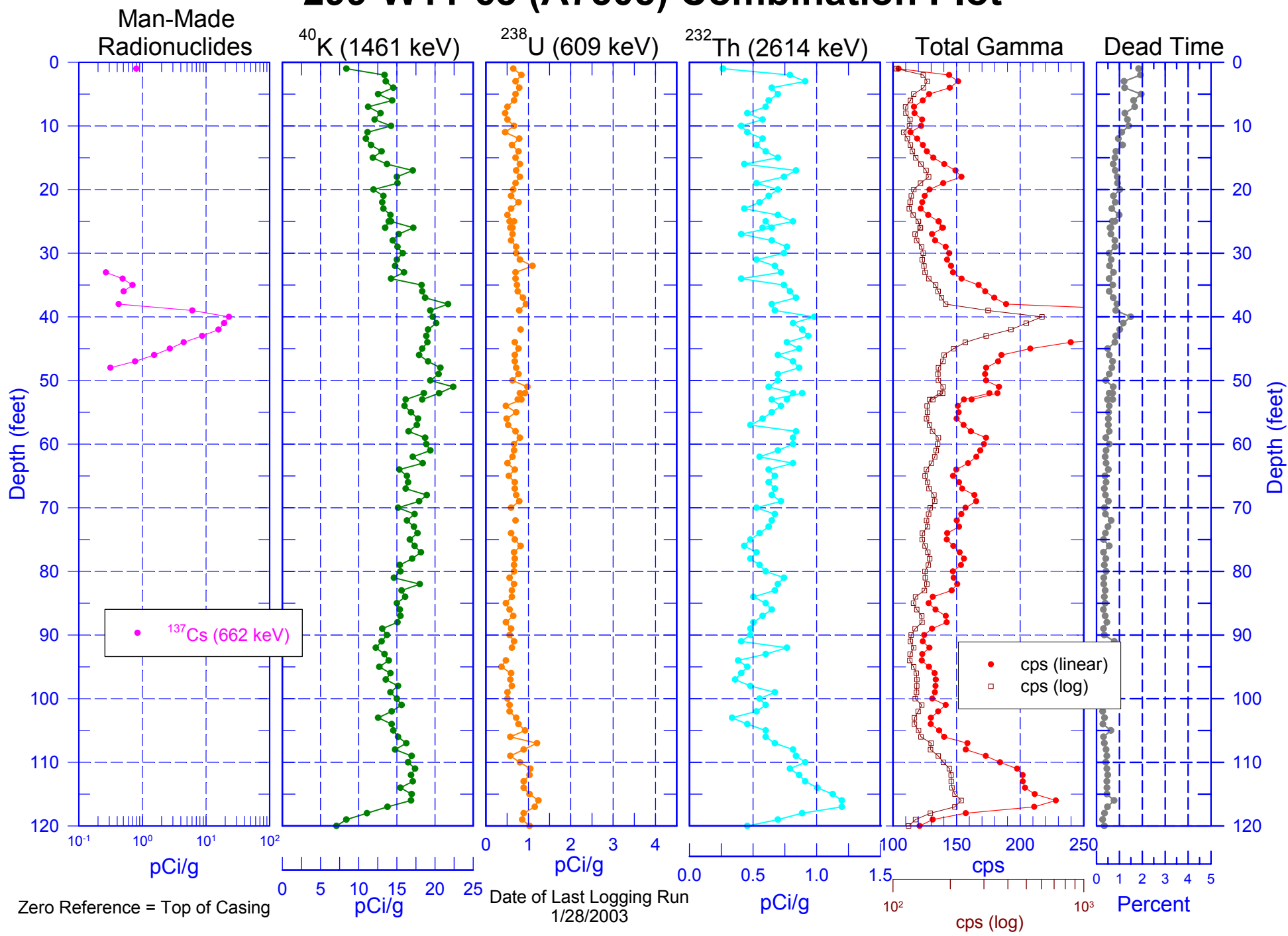
Date of Last Logging Run  
1/28/2003

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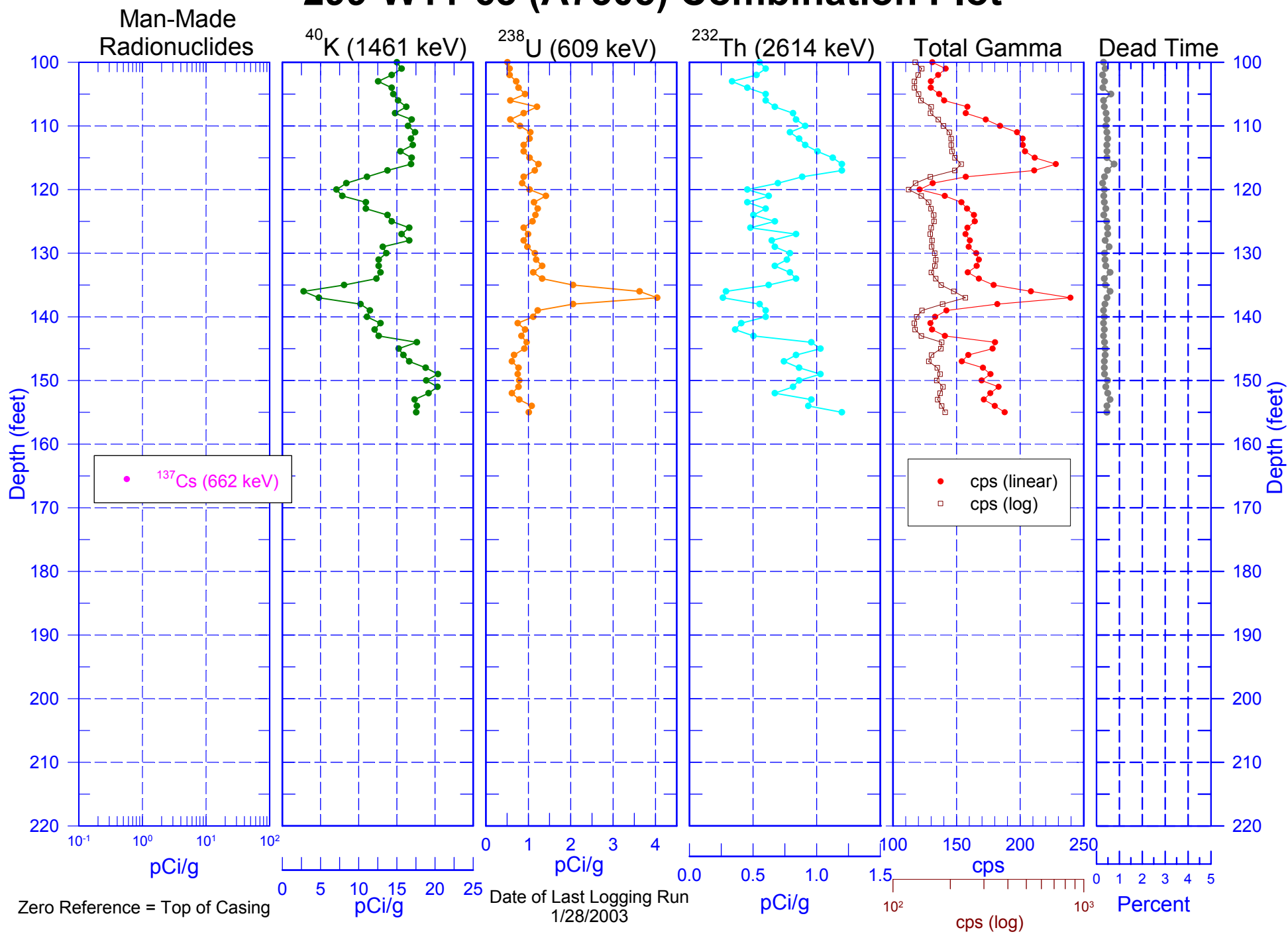
## Natural Gamma Logs



# 299-W11-63 (A7305) Combination Plot



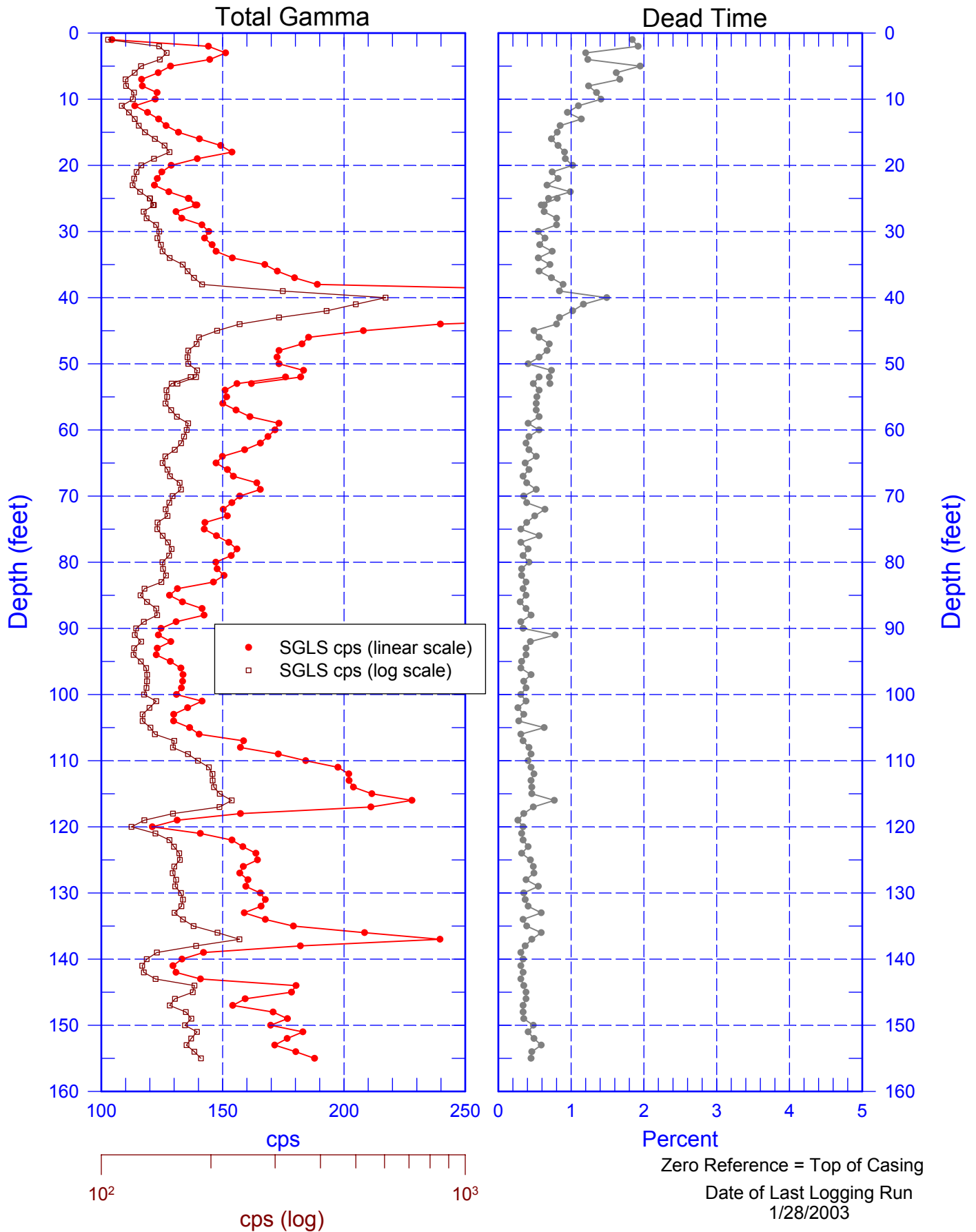
# 299-W11-63 (A7305) Combination Plot



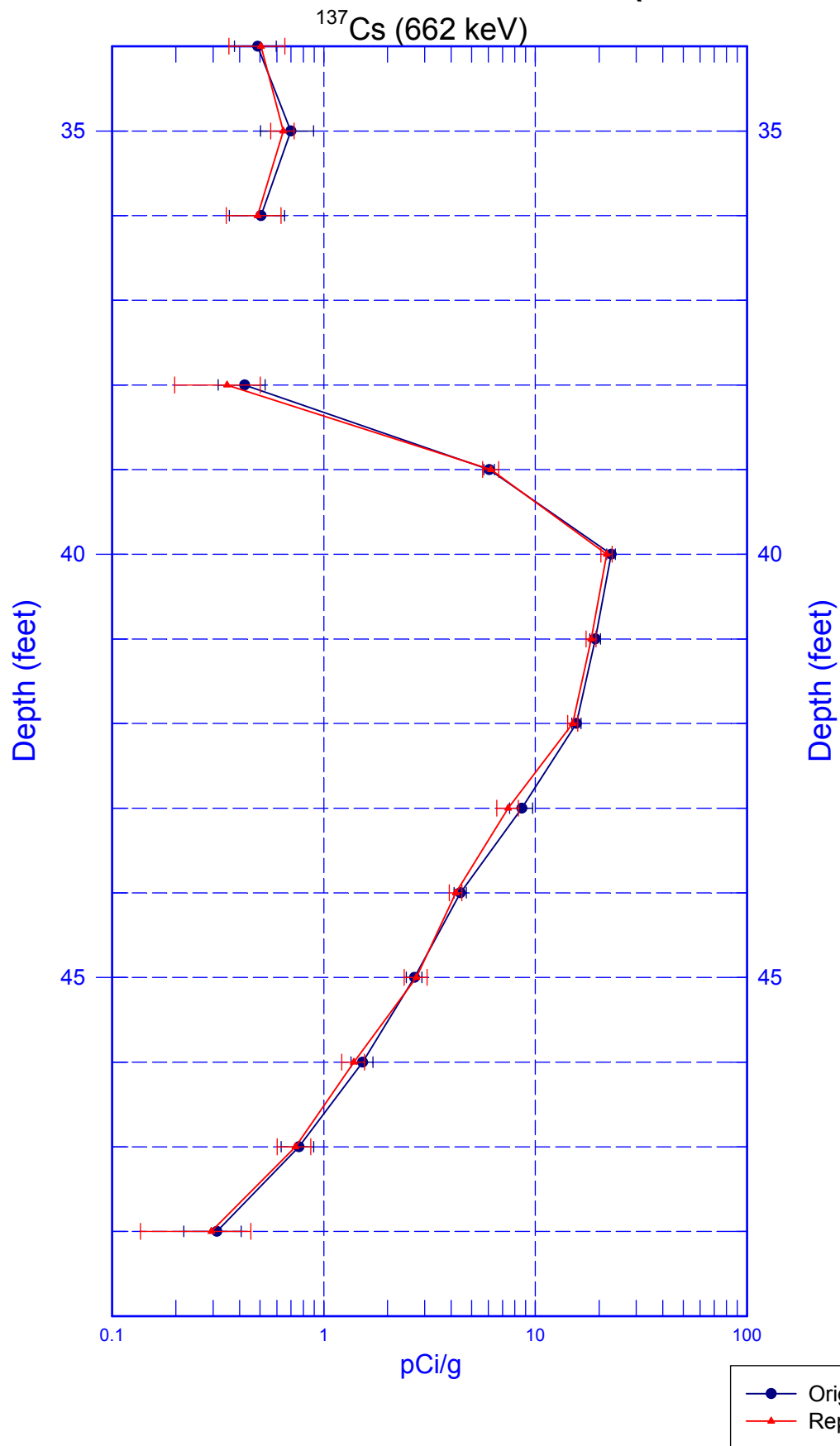


# 299-W11-63 (A7305)

## Total Gamma & Dead Time

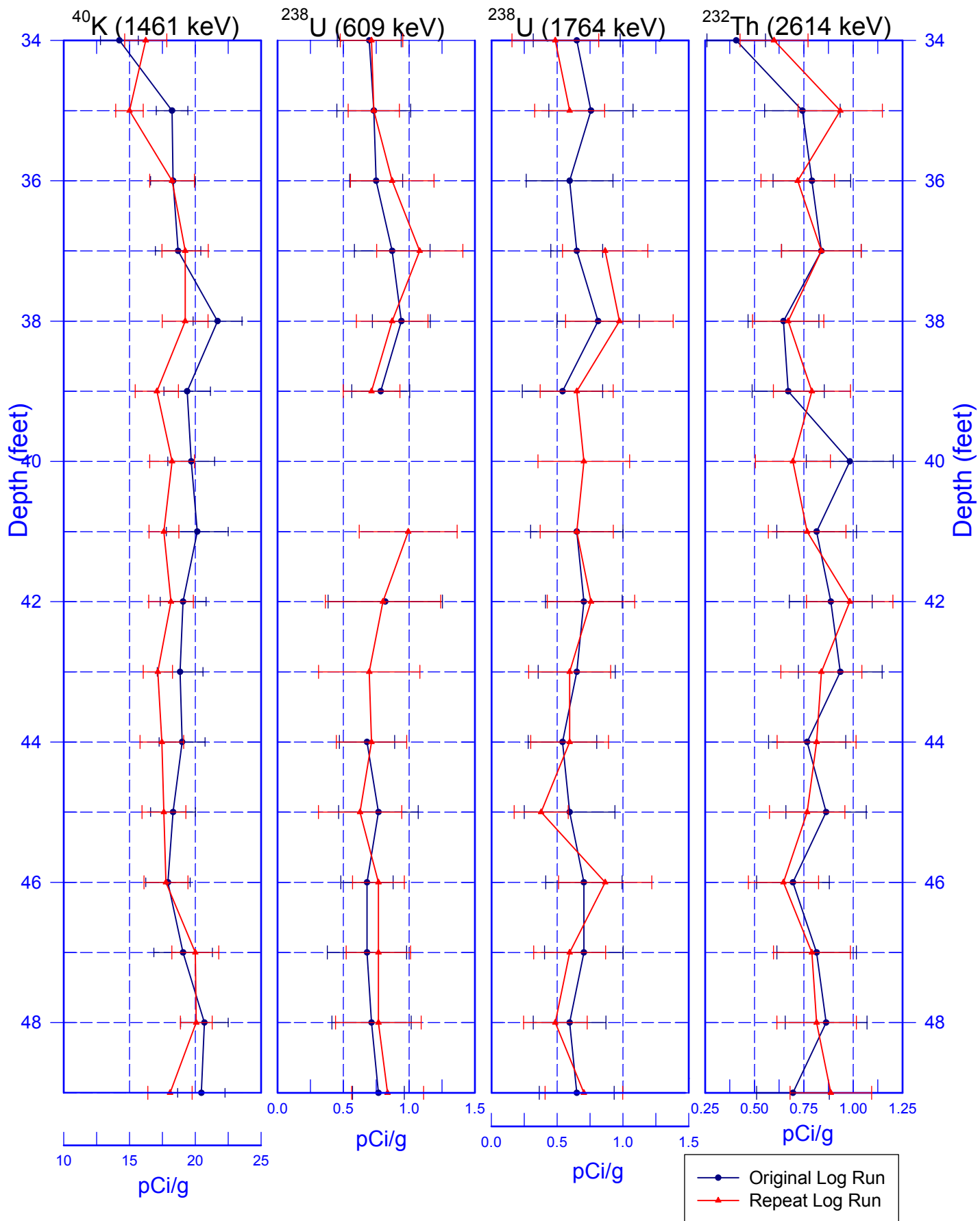


**299-W11-63 (A7305)**  
**Rerun of Man-Made Radionuclides (49.0 to 34.0 ft)**



# 299-W11-63 (A7305)

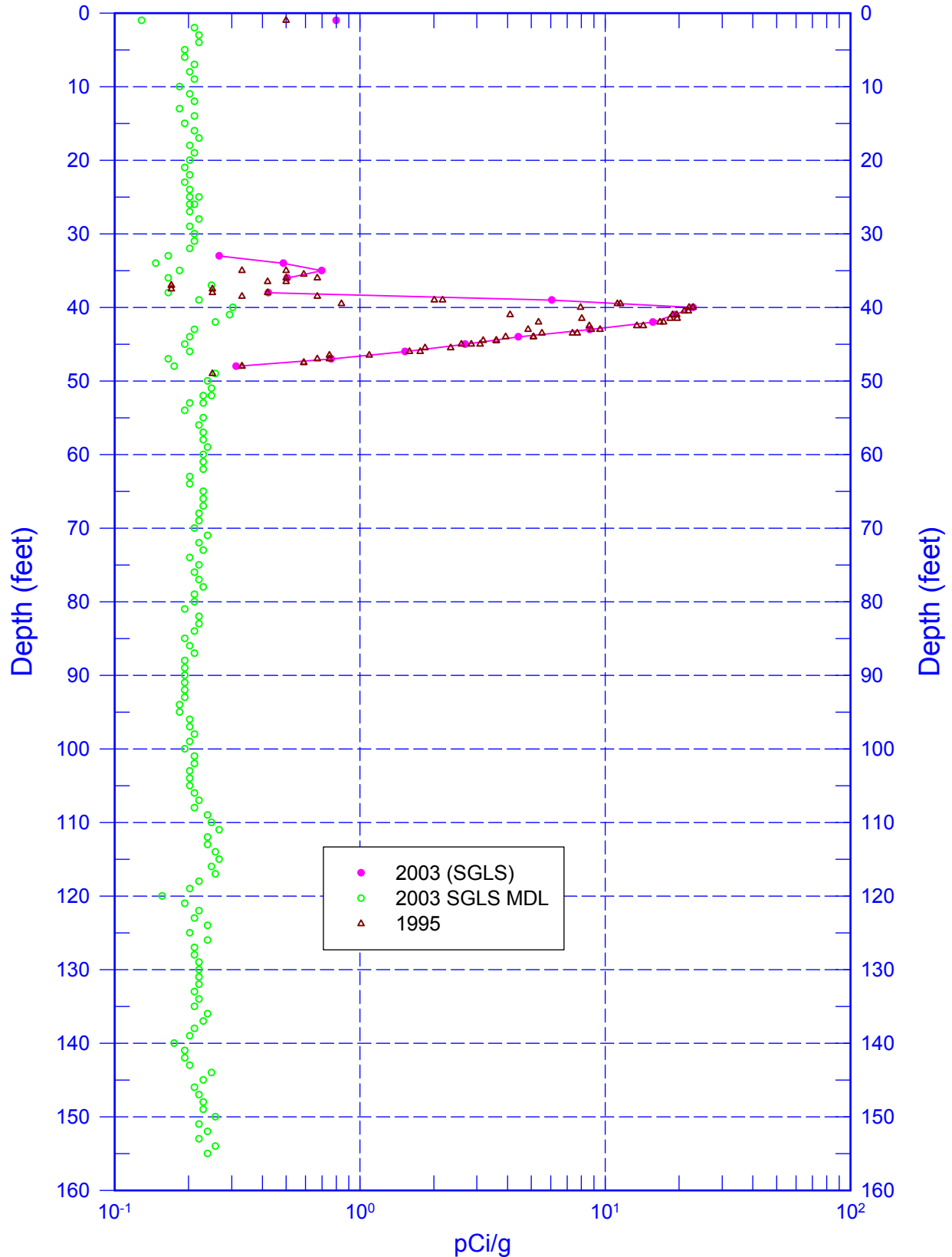
## Rerun of Natural Gamma Logs (49.0 to 34.0 ft)



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RLS Data Compared to SGLS Data

Cs-137 Decayed to 1/28/2003



Zero Reference = Top of Casing (2003 SGLS & 1995 RLS)